

Claims

1. (Amended) A method for displaying a color image comprising the steps of:
- illuminating a multilevel optical phase element with a light source having a plurality of wavelengths of interest, said multilevel phase element dispersing light from said light source by diffraction and focusing the dispersed light onto an imaging plane; and actuating a light modulating display in the imaging plane having a plurality of pixel elements, each said pixel element assigned to transmit a predetermined spectral region, within the near field region of said multilevel display element so as to receive said dispersed and focused light from said multilevel optical phase element.

2. The method of claim 1 wherein said display is positioned at a distance Z from said multilevel optical phase element, wherein Z is determined by the relationship:

$$\frac{T^2}{3\lambda_{Long}} < Z < \frac{2T^2}{3\lambda_{Short}}$$

wherein T is the periodicity of said multilevel optical phase element, λ_{Long} is the longest wavelength of said plurality of wavelengths of interest and λ_{Short} is the shortest wavelength of said plurality of wavelengths of interest.

3. (Amended) The method of claim 1 further comprising providing a light source having a polychromatic spectrum.
4. (Amended) The method of claim 1 further comprising providing a plurality of subsources each subsource having a different spectral distribution.
5. (Amended) The method of claim 4 further comprising emitting light from each said subsource with a light emitting diode.

6. (Amended) The method of claim 4 further comprising providing a laser as each said subsource.

7. (Amended) The method of claim 1 further comprising providing a multilevel optical phase element that is multilevel in two othogonal directions.

8. The method of claim 2 wherein said display is positioned at a distance Z from said multilevel optical phase element, wherein Z is determined by the relationship:

$$\frac{T^2}{3\lambda_{Long}} < Z < \frac{2T^2}{3\lambda_{Short}}$$

wherein T is the periodicity of said multilevel optical phase element, λ_{Long} is the longest wavelength of said plurality of wavelengths of interest and λ_{Short} is the shortest wavelength of said plurality of wavelengths of interest.

9. The method of claim 2 wherein said display is positioned at a distance Z from said multilevel optical phase element, wherein Z is determined by the relationship:

$$\frac{T^2}{3\lambda_{Long}} < Z < \frac{T^2}{3\lambda_{Short}}$$

wherein T is the periodicity of said multilevel optical phase element, λ_{Long} is the longest wavelength of said plurality of wavelengths of interest and λ_{Short} is the shortest wavelength of said plurality of wavelengths of interest.

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Sub
B5

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light and focus

12. The method of claim 11 wherein said display is positioned at a distance Z from said multilevel optical phase element, wherein Z is determined by the relationship:

$$\left| \frac{T^2 Z_s}{3\lambda_{long} Z_s - T^2} < Z < \frac{2T^2 Z_s}{3\lambda_{short} Z_s - 2T^2} \right|$$

$$\frac{2T^2 Z_s}{3\lambda_{long} Z_s - 2T^2} < Z < \frac{2T^2 Z_s}{3\lambda_{short} Z_s - 2T^2}$$

wherein T is the periodicity of said multilevel optical phase element, Z_s is equal to the distance between said multilevel optical phase element and said lenslets minus the focal length of said lenslets.

14. The method of claim 11 wherein said multilevel optical phase element is constructed such that a magnification produced by said plurality of lenslets produces an dispersion element of a size substantially equal to the dimensions of each pixel element in said display.
15. The method of claim 14 wherein said magnification (M) is given by the equation:

$$M = 1 + \frac{Z}{Z_s}$$

wherein T is the periodicity of said multilevel optical phase element, Z_s is equal to the distance between said multilevel optical phase element and said lenslets minus the focal length of said lenslets and Z is the distance between said multilevel optical phase element and said display.

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16. (Amended) A system for displaying a color image comprising:
a light source emitting a plurality of wavelengths of interest;
a multilevel optical phase element positioned to receive light from said light source, said multilevel phase element dispersing light from said light source by diffraction and focusing the dispersed light onto an imaging plane; and
a light modulating electronic display positioned in the imaging plane and having a plurality of pixel elements, each said pixel element assigned to transmit a predetermined spectral region, positioned within the near field region of said multilevel optical phase so as to receive said dispersed light from said multilevel phase element.

17. The system of claim 16 wherein said display is positioned at a distance Z from said multilevel optical phase element, wherein Z is determined by the relationship:

$$\frac{T^2}{3\lambda_{Long}} < Z < \frac{2T^2}{3\lambda_{Short}}$$

wherein T is the periodicity of said multilevel optical phase element, λ_{Long} is the longest wavelength of said plurality of wavelengths of interest and λ_{Short} is the shortest wavelength of said plurality of wavelengths of interest.

18. The system of claim 17 wherein said display is positioned at a distance Z from said multilevel optical phase element, wherein Z is determined by the relationship:

$$\frac{2T^2}{3\lambda_{Long}} < Z < \frac{2T^2}{3\lambda_{Short}}$$

wherein T is the periodicity of said multilevel optical phase element, λ_{Long} is the longest wavelength of said plurality of wavelengths of interest and λ_{Short} is the shortest wavelength of said plurality of wavelengths of interest.

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region, positioned so as to receive said dispersed light from said multilevel optical phase element.

26. (Amended) The system of claim 25 wherein said plurality of focusing elements comprises a plurality of lenslets and wherein said display is positioned at a distance Z from said multilevel optical phase element, wherein Z is determined by the relationship:

$$\left[\frac{T^2 Z_s}{3\lambda_{\text{long}} Z_s - T^2} < Z < \frac{2T^2 Z_s}{3\lambda_{\text{short}} Z_s - 2T^2} \right]$$

$$\frac{2T^2 Z_s}{3\lambda_{\text{long}} Z_s - 2T^2} < Z < \frac{2T^2 Z_s}{3\lambda_{\text{short}} Z_s - 2T^2}$$

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wherein T is the periodicity of said multilevel optical phase element Z_s is equal to the distance between said multilevel optical phase element and said lenslets minus the focal length of said lenslets, λ_{long} is the largest wavelength of said plurality of wavelengths of interest; and λ_{short} is the shortest wavelength of said plurality of wavelengths of interest.

27. The system of claim 26 wherein said plurality of focusing elements comprises a plurality of lenslets and wherein said display is positioned at a distance Z from said multilevel optical phase element, wherein Z is determined by the relationship:

$$\frac{2T^2 Z_s}{3\lambda_{\text{long}} Z_s - 2T^2} < Z < \frac{2T^2 Z_s}{3\lambda_{\text{short}} Z_s - 2T^2}$$

wherein T is the periodicity of said multilevel optical phase element Z_s is equal to the distance between said multilevel optical phase element and said lenslets minus the focal length

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$$M = 1 + \frac{Z}{Z_s}$$

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The system of claim 32 wherein each said subsource is a laser.